



Pluchea rubelliflora and *Pterocaulon sphacelatum* (Asteraceae): new to Victoria's semi-arid floodplains

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Introduction

Environmental watering or flows are being implemented by Governments to improve the health of river and floodplain ecosystems. A key component of environmental watering is monitoring vegetation responses to these managed flood events. As such, an increase in botanical surveys in these riparian systems has occurred over recent years. While undertaking recent botanical surveys on the semi-arid (mean annual rainfall ~300 mm, ABOM 2019) floodplains of Hattah-Kulkyne and Murray-Sunset National Parks, in north-western Victoria, two species new to the state were discovered. Specimens submitted to the National Herbarium of Victoria were identified as *Pluchea rubelliflora* (F.Muell.) B.L.Rob. and *Pterocaulon sphacelatum* (Labill.) Benth. ex F.Muell. Subsequent to these discoveries, in February 2019, *Pterocaulon sphacelatum* was also discovered on the Lindsay River anabranch creek floodplain. This part of north-west Victoria is arid, with approximately 270 mm mean annual rainfall (ABOM 2019). Thus far, Victoria has been

Abstract

Two species of Asteraceae, *Pluchea rubelliflora* (F.Muell.) B.L.Rob. and *Pterocaulon sphacelatum* (Labill.) Benth. ex F.Muell., have been discovered for the first time in Victoria on the semi-arid floodplains of Hattah-Kulkyne National Park and the adjacent Murray-Kulkyne Park. *Pterocaulon sphacelatum* was also discovered on a floodplain of Lindsay Island at Murray-Sunset National Park. The species' taxonomy, distribution and ecology are discussed.

Keywords: Hattah Lakes, Lindsay Island, flooding, rare plants

the only mainland state from which both of these genera of native Asteraceae have yet to be found. Both species belong to the *Pluchea*-group of genera (Inuleae-Pluchinae) and are well distributed across much of central and northern Australia.

Taxonomy

The subtribe Pluchinae consists of 34 genera and approximately 270 species, with a cosmopolitan distribution. The subtribe is best represented in Africa and, to a lesser degree, in the Americas, Asia and Australasia. In Australia there are 10 genera (six endemic), and 50 species, all indigenous (Bean 2015a, b; APC 2018). *Pluchea* Cass. is a genus of about 50 species, found predominantly in tropical and subtropical regions of the world. In Australia there are 13 *Pluchea* species, 12 of which are endemic (Bean 2015a). *Pluchea* can be recognised based on a combination of characters: plants are usually aromatic; capitula are simple, solitary to several in terminal peduncles or in terminal panicles,

disciform, homogamous or heterogamous; involucre bracts unequally 3–4-seriate; florets all tubular; outer (i.e. marginal) florets are female, pappus of free uniseriate capillary bristles; disc florets fewer, bisexual or functionally male (Bean 2015a; Stajsic 2018a).

Pterocaulon Elliott comprises 26 species distributed across North and South America, south-east Asia, Malaysia, Melanesia, and Australia. It is represented in Australia by 13 species, six of which are endemic (Bean 2015b). *Pterocaulon* is readily recognised by its winged stems, formed from decurrent leaf bases, sessile capitula grouped into secondary heads, and a pappus of capillary bristles (Bean 2011; Stajsic 2018b).

Pluchea rubelliflora (F.Muell.) B.L.Rob.

Perennial herb or subshrub to 15–60 cm high. Stems ascending to erect, usually conspicuously narrowly winged from decurrent leaf bases, glabrous or glabrescent. Leaves narrowly lanceolate to oblanceolate to broadly oblanceolate, 9–50 mm long, 2–7 mm



Figure 1. a. *Pluchea rubelliflora*, dried specimen, Hattah Lakes, Lake, Yelwell (MEL 2439613).
b. *Pterocaulon sphacelatum*, Murray-Kulkyne Park (MEL 2439614).

wide, 4.5–12 times longer than wide, margins entire or denticulate to dentate, apex acute, glabrous or glabrescent. Capitula solitary to several in terminal clusters, hemispherical, 4–5 mm long, peduncle 1–12 mm long; outer involucre bracts 1.3–1.8(–2.6) mm long, lanceolate, apex acute to acuminate, glabrous to sparsely glandular or with a mixture of glandular and eglandular hairs, margin scarious; inner involucre bracts (2.8–)3.0–4.2(–4.5) mm long, lanceolate, linear, apex acute. Outer florets (i.e. female) numerous, 2.0–2.5(–3.5) mm long, corolla tube filiform, white or pink-tinged; style white; achenes 0.6–0.8 mm long, glabrous, red-brown; pappus bristles 10–13, 1.8–2.5 mm long. Disc florets 5–30, 2.0–3.0(–4.0) mm long, corolla tube cylindrical; style mauve; achenes pale, abortive (adapted from Hunger 1997; Bean 2015a; Stajsic 2018c).

Phenology: The Victorian plants were collected in flower in April 2018 (Figs. 1a, 2). Outside Victoria, the flowering and fruiting period is (April–)May to November (Bean 2015a).

Notes: *Pluchea rubelliflora* (Winged Plains-bush) is distinguished from other Australian *Pluchea* species by its glabrous or glabrescent stems and leaves, relatively small capitula and decurrent leaves (Bean 2015a).

Specimen examined: VICTORIA. Hattah Lakes National Park. Lake Yelwell area, 19.iv.2018, C. Moxham s.n and S. Kenny (MEL2439613).

Habitat and ecology: *Pluchea rubelliflora* is widespread in lower rainfall areas of Australia, mainly in the tropics and subtropics, but extending almost to Port Augusta in South Australia (Bean 2015a). Indeed, *Pluchea rubelliflora* and a number of species from other genera in Plucheinae are known to inhabit seasonally wet areas, swamps, claypans, dry rivers and tidal flats (Jessop and Toelken 1986; Cunningham *et al.* 1992; Bean 2015a). Hunger (1997, p. 211) commented that the species is abundant, and that “During a collecting trip in the Pilbara region I found this species on nearly every dry river bank and near every waterhole on sandy soil or red clayed loam...”

In Victoria, a population of approximately ten plants was discovered at a long-term monitoring site at Lake Yelwell, in Hattah-Kulkyne National Park (Moxham *et al.* 2018, 2019). The population occurs on the higher floodplain in the Intermittent Swampy Woodland Ecological Vegetation Class (Fig. 3). This vegetation



Figure 2. *Pluchea rubelliflora*, dried specimen, Hattah Lakes, Lake, Yelwell (MEL 2439613). **a.** capitula. **b.** leaf, showing diagnostic decurrent base. Photo: Ian Clarke, Honorary Associate at National Herbarium of Victoria

type is characterised by a mixed overstorey of River Red Gum (*Eucalyptus camaldulensis* Dehnh. subsp. *camaldulensis*), Black Box (*E. largiflorens* F.Muell.) and Eumong (*Acacia stenophylla* A.Cunn. ex Benth.). The variable flood-respondent understorey is dominated by a range of flood-stimulated species in association

with flora tolerant of inundation (White *et al.* 2003). This woodland type occurs on low elevation river terraces of the floodplain often adjacent to lakes and waterways. Soils often have a shallow sand layer over heavy and frequently slightly brackish soils (White *et al.* 2003).

The Lake Yelwell site has had detailed floristic monitoring annually since 2014 as part of a five-year monitoring program examining vegetation responses to environmental watering (Moxham *et al.* 2018, 2019). The site appears to have had a disturbance history that has resulted in low vegetation quality; with a high amount of bare ground (20%) and litter (60%) cover, but low weed cover (< 5%). The cover of vegetation (both native and exotic) and ground layer substrate appears to fluctuate annually in relation to water availability, likely from both rainfall and flooding. *Pluchea rubelliflora* was discovered at the site for the first time in 2018. The species was not detected in another monitoring site at Lake Yelwell, nor any other of the 18 sites monitored

throughout the Hattah Lakes system as part of this program. A search was conducted in a 300 m area surrounding the population, but no further plants were detected.

In the spring and summer of 2017/2018, a large environmental watering event inundated this site (to an elevation of 45 m above sea level). The two previous flood events in the spring/summer of 2014/15 and 2016/17 did not reach this part of the site which occurs on the higher elevation floodplain. Indeed, it is probable that inundation from the 2017/2018 environmental watering event stimulated seed germination from the soil seed bank, although studies would need to confirm the species presence in the soil seed bank. While little information is available on the seed dispersal of *P. rubelliflora*, other species within the genus (e.g. *P. carolinensis* (Jacq.) G. Don, *P. dentata* R.Br. ex Benth., *P. indica* (L.) Less., *P. odorata* (L.) Cass. and *P. rosea* Godfrey) are wind dispersed (Jurado *et al.*



Figure 3. *Pluchea rubelliflora* habitat on the higher floodplain in Intermittent Swampy Woodland at Lake Yelwell, Hattah-Kulkyne National Park

1991; Alyokhin *et al.* 2001; Francis 2004; Mossman 2009). The seeds of *P. odorata* may require wet bare soil to germinate (Mild 2003) and the pappus of *P. carolinensis* may provide seeds with a temporary buoyancy thus facilitating dispersal by water (Francis 2004; Erickson and Puttock 2006). *Pulchella rubelliflora* has been noted to be often short-lived and more abundant in wet years (Cunningham *et al.* 1992). It is unlikely that seed from this species was dispersed in floodwaters from the Murray-Darling Basin as occurrences in other States are predominantly outside the Basin waterways (e.g. ALA 2018). Furthermore, the discovery of this population represents a large range extension for the species (e.g. over 500 km; ALA 2018). The closest known occurrence is an 1861 collection from northeast of Broken Hill (MEL2165775). Whilst an adventive origin is conceivable for such a disjunct occurrence, consistency of habitat with that of indigenous occurrences outside Victoria suggests that the Victorian occurrence is also indigenous.

Conservation Status: *Pluchea rubelliflora* is known in Victoria from a single population of approximately 10 plants, with all individuals at the same location with an area of c. 225 m². The species is assessed as Critically Endangered in Victoria since it qualifies under criterion CR D sensu IUCN (2012) based on its very limited population size and, arguably, also criterion CR B1ab(iii) c(iv)+2ab(iii)c(iv) based on its highly disjunct occurrence at a single Victorian location subject to declining frequency of middle and higher order flood events, observed intense browsing impacts and physical damage at the site caused by feral pigs and goats, and the reported and inferred seasonal fluctuation in population size.

***Pterocaulon sphacelatum* (Labill.) F.Muell.**

Biennial or short-lived perennial, strongly aromatic, herb or subshrub to 20–100(–120) cm high, and often as wide. Stems single or numerous, ascending to erect, conspicuously winged from decurrent leaf bases, densely lanate and sometimes with occasional globose sessile glands; wings entire or sparsely toothed, 0.7–2.0 mm wide. Leaves oblanceolate to obovate, 20–65 mm long, 4–15 mm wide, 3.3–5.8 times longer than wide, margins recurved, denticulate, with 6–14 pairs of blunt teeth, apex obtuse or acute; upper surface

moderately bullate, sparsely to moderately densely lanate; lower surface moderately to densely lanate, and also with dense, globose, sessile, yellow glands. Capitulescences in terminal clusters, globose or ellipsoid, 10–15 mm long, 1–1.4 times longer than wide; peduncles 0–22 mm long. Outer involucre bracts 2.2–3.7 mm long, spatulate, apex acute, with dense spreading lanate hairs throughout, glands absent; longest inner involucre bracts 3.5–4.6 mm long, linear, apex acute, upper margins conspicuously toothed or lacerate. Outer florets (i.e. female) 17–30, 2.4–3.2 mm long, corolla tube filiform, always partly pink or violet, fertile; achenes 0.7–1.0 mm long, red-brown with 20–50 twin hairs; pappus a single row of barbellate capillary bristles, connate at base, persistent. Disc floret (hermaphrodite, functionally male), solitary, 2.5–3.7 mm long, corolla tube cylindrical, pink; achenes pale, abortive (Adapted from Bean 2011; Bean 2015b; Stajsic 2018d).

Phenology: Two Victorian plants were collected in flower, the first in May 2018 and the second in February 2019 (Fig. 1b). Outside Victoria, flowers and fruits occur from June to October in northern parts of the range, and from August to December in southern parts (Bean 2011).

Notes: *Pterocaulon sphacelatum* (Applebush, Fruit Salad Plant) is distinctive in having the upper margins of the inner involucre bracts often lacerate, and entire or sparsely toothed. Secondary heads all terminal, often ellipsoid, up to 1.4 times longer than wide; inner bracts always partly pink to violet; leaves oblanceolate, with the upper surface bullate; corolla lobes of disc floret short (Bean 2011).

Specimens examined: VICTORIA. Murray-Kulkyne Park. Approximately 1.6 km NW of the junction of River and Goosefoot tracks, 2 km N of Kulkyne Station and 9 km SE of Colignan, 14.v.2018, K. Bennetts *s.n.* (MEL2439614); Murray-Sunset National Park, Lindsay Island, eastern end, 26.ii.2019, Ian Sluiter IRKS 19/68 (MEL).

Habitat and ecology: A single plant was discovered approximately 1.6 km north-west of the junction of River and Goosefoot tracks in the Murray-Kulkyne Park south-east of Colignan. The plant was found on a river terrace in the Intermittent Swampy Woodland Ecological Vegetation Class (described above), an area that had been flooded within the last year (Fig. 4). The second plant, with flowering heads showing at least two seasons of growth, was discovered in Murray-Sunset

National Park at the eastern end of Lindsay Island. The plant inhabited Shrubby Riverine Woodland Ecological Vegetation Class, which was dominated by River Red Gum *Eucalyptus camaldulensis* subsp. *camaldulensis* and composed of a range of drier-floodplain species with a sparse shrub layer of: Nitre Goosefoot (*Chenopodium nitrariaceum* (F.Muell.) F.Muell. ex Benth.), Tangled Lignum (*Duma florulenta* (Meisn.) T.M.Schust.), Black Cotton Bush (*Maireana decalvans* (Gand.) Paul G.Wilson), Bignonia Emu-bush (*Eremophila bignoniiflora* (Benth.) F.Muell.), Spotted Emu-bush (*Eremophila maculata* (Ker Gawl.) F.Muell.). This vegetation type occurs on the less flood-prone waterway fringes and more elevated lower terraces, where flooding is infrequent (White *et al.* 2003). The site, however, was inundated in 2016 under an environmental flow regime designed to inundate floodplain and wetland sites at the eastern end of Lindsay Island.

Pterocaulon sphacelatum is the most widespread

Australian *Pterocaulon* species (Bean 2011). It grows on a range of sandy to clay-loam soils, on stony hillsides (higher rainfall areas) or creek-beds (arid areas), in grassland (often dominated by *Triodia* spp.), eucalypt woodland, or low open woodland with Mulga (*Acacia aneura* F.Muell. ex Benth.) and other *Acacia* spp. The species is common in areas subject to flooding (Cunningham *et al.* 1992). Based on herbarium collections, the closest known occurrence of this species to the Victorian one is a single 1976 collection (NSW582322) from the Wentworth district in New South Wales. There are also herbarium collections from Scotia Sanctuary in New South Wales in 2011, and from Danggali Conservation Park and Wilderness Protection Area in South Australia in 1980. In 2011/12, following heavy La Niña rainfall events across south-west New South Wales, *Pterocaulon sphacelatum* was observed to germinate in a flooded run-on depression herbland/grassland covering approximately five hectares at a



Figure 4. *Pterocaulon sphacelatum* habitat on a river terrace in Intermittent Swampy Woodland near Raak Track and Chalka Creek SE of Colignan, Murray-Kulkyne Park.

grazing property 40 km west of Pooncarie. Several thousand plants persisted for two years at that site until eventually senescing and dying. The soils at that site were Worrinen Formation clay loam above poorly draining Callabonna Clay and Blanchetown Clay subsoils (Ian Sluiter, pers. obs., September 2012). The Hattah and Lindsay Island specimens represent a small but important range extension. It is unknown whether these plants were found due to increased survey effort – that is, surveying previously unsurveyed habitat – or as a result of a recent colonisation event into previously unoccupied habitat. *Pterocaulon sphacelatum* fruit is wind dispersed (Jurado *et al.* 1991; Erickson *et al.* 2016) as are those of other species within the genus e.g. *P. lanatum* Kuntze (de Cassia Frenedoza 2004). The species is known to be tolerant of disturbances and is, hence, likely to be an opportunistic recruiter. However, the discovery of the second plant at Lindsay Island makes it more likely that the species is indigenous to Victoria rather than a new arrival.

The vernacular name Fruit Salad Plant is derived from the “sweet, fruity aroma emitted from the plant when it is crushed or rubbed” (Cunningham *et al.* 1992, p. 685).

Conservation Status: *Pterocaulon sphacelatum* is known in Victoria from two plants. The species is assessed as Critically Endangered in Victoria since it qualifies under criterion CR D sensu IUCN (2012) based on its small population size.

Concluding remarks

The two species discussed here were discovered while conducting botanical surveys investigating floodplain vegetation responses to managed flood events. Both species naturally occur in these riparian environments and can respond to increased water availability, from both rainfall and flood events. However, it is difficult to ascertain whether the discovery of these species was the result of recruitment due to flooding events or the increase in survey effort in these systems. Nevertheless, these two new species records for Victoria are important additions to the state's flora.

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